Work Status Monitoring and Position Tracing for Remote vehicles using Wireless technology

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Abstract – *These proposed project is an attempt to use Global Postioning System and GSM technology to locate the Earthmovers in the remote areas, where owner cannot keep watch on the Earthmovers like Bulldozer, Excavators, Tractors, and Poclains. It can provide owner the information about location, engine on/off and fuel level of Earthmover on the owners mobile phone and can also save on the memory. When the Earthmover is in the remote areas where there is no network available these system stores all the information on the memory provided on the board present on the Earthmover, owner can access these data later. This system contain single boarded embedded system which contain GPS, GSM module and Memory along with the ARM based processor that is installed on the vehicle. These system is also connected to fuel level sensor which is used to detect fuel consumption and fuel theft.*

Key Words: Embedded ARM, Monitering, GPS, GSM, Fuel level sensor.

1. INTRODUCTION

In case of construction, mining, transportations and agricultural work the Earth movers like the Bulldozer, Excavators, Tractors, and Poclains and heavy trucks are playing very important roles[1]. These earth movers have very high initial as well as maintenance cost and due to this there any kind of malfunctioning is not affordable to owners[1]. The owners of the Earth mover can't keep watch on their earth movers, when it moves in remote places, so that malfunctioning with them may takes place. If these earth movers have the remote monitoring system which only under observation of owner so any time owner can catch the earthmover movements, it will be monitoring and find positioning and control system as well. Nowadays the most widely used positioning system is GPS it can collect the longitude and latitude of the view point. The design such System Based on ARM a combination of GPS and GSM can upload the information of the Earth movers such as the position, speed, fuel[2]

and other parameters to the Monitoring center in time, to make it convenient to keep watch on remote Earth movers. What's more, owner can block Earth movers, for avoiding robbery or any malfunctioning.

2. Hardware Design

2.1 System Structure

In proposed work the system consists of ARM, GSM module, GPS module LCD and the sensors. The sensor interfaces can be connected to the earth mover unites for the detection of a variety of status data. The block diagram of the terminal board is shown in figure 1. The hardware structure of the system is dominated by ARM controller, GPS module, and GSM module, antenna, and other components. ARM controller as a central processing unit of the system, ARM embedded system has a critical influence on overall performance with real-time simulation and tracking. It has own of static RAM, embedded high speed Flash memory and A/ D converter. It has Real-time clock and watchdog. The rich on-chip resources can meet the needs of general industrial control. It works stably and faster, is accessible to the plan. This design adapts the current leading GPS technology[7] and the integrated positioning[1]. A GPS receiver module with high sensitivity, low power consumption, and 20 channels solutions[1][8] to help Users gain and continuously track GPS signals at a very low signal intensity, which means can be used in the environment where it has never been thought to be accessible, such as Buildings in the city, dense forest and many indoor environment, with a positioning accuracy of less than 10 meters. GSM module[1][8] is used for wireless communication. Having gained the domestic network card of Radio equipment, it operates in dual-band GSM900 and GSM1800, with power consumption of 2W and 1W respectively[1][8]. Through this Interface, system can have realtime monitoring of Earth mover's Information, in order to make response timely. The GPS tracks latitude and longitude of the earth mover. With the help of multimedia cell phone or computer with internet, we can find exact location[6] of the earth mover equipped with this system. In case of

power failure, transaction details are retained and available for use when the power supply is resumed, and this includes transactions in progress at the time of the power failure which are automatically saved. This system is not only useful for control and stops the fuel theft by the driver but also it restricts the driver to work at another site without permission of the owner.
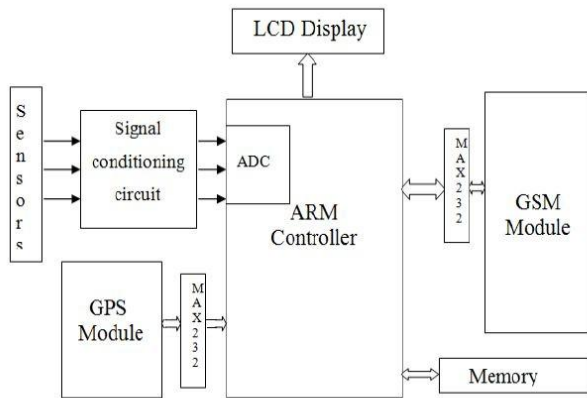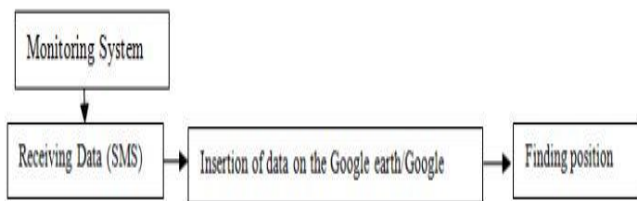

Fig -1: Block at Transmitter

Fig -2: Block at Reciever

The GPS gives us latitude and longitude, if we put these values on google maps on multimedia cell phone or personal computer it gives us location and through this owner can track the object, when it moves out of coverage area he can also take respective actions.

Microcontroller
- A single chip 16/32 bit microcontroller
- On-chip RAM, ROM, I/O ports.

Example ARM perfectly fits many uses, from automotive industries and controlling home appliances to industrial, instruments, remote sensors, electrical door locks and safety devices. It is also ideal for smart cards as well as for battery supplied devices of its low consumption EEPROM memory makes it easier to apply microcontrollers to devices where permanent storage of various parameters needed. Low cost, low consumption, easy handling and flexibility make ARM applicable. The LPC2141/42/44/46/48 microcontrollers are based on a

16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high-speed flash memory ranging from 32 kB to 512 kB[9]. In these system we have used LPC2148 microcontroller which has following feature[9]-

- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- EmbeddedICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip RealMonitor software and high-speed tracing of instruction execution.
- Serial communications interfaces ranging from a USB 2.0 Full-speed device,multiple UARTs, SPI, SSP to I2C-bus.
- Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.
- Up to 21 external interrupt pins available.
- On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz.

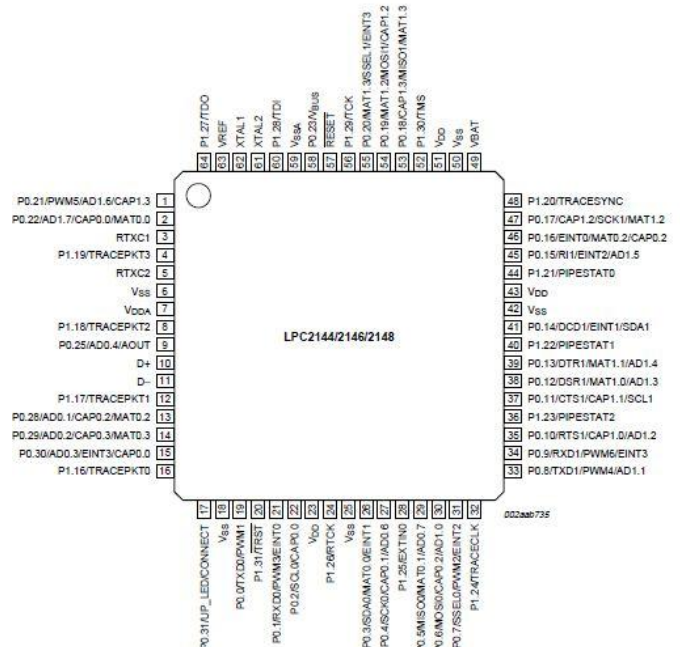Following figure-3 shows the pin diagram of the LPC 2148 microcontroller[9].

Fig -3: Pin diagram of LPC2148 Microcontroller

GSM Module and GPS Module

Messages sent by the user are received by the **GSM** module. 1) ARM will play important role in sending and receiving commands to GPS. 2) ARM extracts the location name and sends the same to the GSM via serial

communication. ARM will find location and send details to GSM Mobile using serial communication system.

The Signal from the GPS satellites is received and the receiver used a standard form of message decoding. These standards are called as NMEA 1) the receiver has a Serial Communication facility which is used to interface with the external devices like PC or ARM. The PC or ARM (with LCD) is connected as per the pin details 2)The Antenna of the GPS receiver is fixed at Line of site to the satellite and once the Receiver receives the signals, the Receiver transfers data to the ARM serial communication Pins which in turn is displayed to the LCD. The data displayed on the LCD is the Latitude and Longitude of the particular location where u keep the antenna of the receiver. In this way a Particular Location is identified. 3) The Antenna receives the data, transfers to the ARM through Serial Port. Micro controller displays on the LCD. The same data can be transferred to the GSM through serial communication.

In these system we have used SIM908 which is the combination of GSM and GPS Module in the SMT package. The SIM908 is the first member of a new family of ARM926EJ-S based modules doubling the core performance frequency versus traditional ARM7 based solutions[8]. At the same time, with advanced, innovative design, the SIM908 can reduce sleep mode power consumption, providing a power saving of up to 40% compared to current industry averages[8]. The product features an integrated internal GPS[8]. Considering the high performance, low power, and small size, SIM908 is an ideal module for many M2M applications where positioning is required at and affordable price[8]. Following are the general features of the SIM908-

- Quad Band 850 / 900 / 1800 / 1900 MHz
- Supply Voltage Range
  -GPRS: 3.2V ~ 4.8V
  -GPS: 3.0V ~ 4.5V
- Normal Operating temperature: -40ºC to +85ºC
- Receiver type - 42-channel
  - GPS L1 C/A code
  - High-performance STE engine
- Point-to-point MO and MT
- SMS cell Broadcast
- Hand-free operation

LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. The reason for being LCD is used in these system is economical; easily programmable; have no limitation of displaying special and even custom characters animations and so on. A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a

predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Following figure-4 shows the Pin Diagram of LCD.
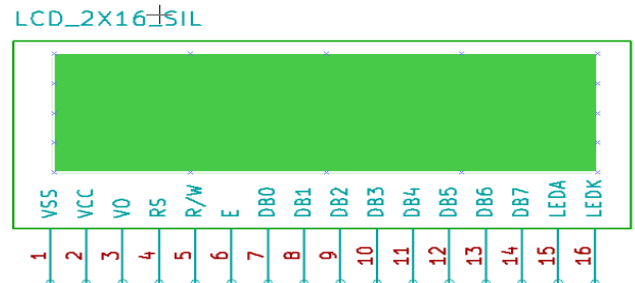
Fig -4: Pin Diagram of LCD

MAX232

MAX232 is used to interface the ARM to standard RS-232 port of GPS Receiver and GSM Modem. The MAX232 device is a dual driver/receiver that includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5-V supply[10]. Each receiver converts TIA/EIA-232-F inputs to 5-V TTL/CMOS levels[10]. These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V, and can accept ±30-V inputs[10]. Each driver converts TTL/CMOS input levels into TIA/EIA-232-F levels[10].It is a signal level converter necessary for conversion between TTL and RS-232 standards. The MAX232 requires 5 external 10uF capacitors. These are used by the internal charge pump to create +10 volts and -10 volts. The MAX232 includes 2 receivers and 2 transmitters so two serial ports can be used with a single chip.

MEMORY

Flash memory is an electronic non-volatile computer storage medium that can be electrically erased and reprogrammed. There are two main types of flash memory, which are named after the NAND and NOR logic gates. Each application of both types of flash memory include personal computers, PDAs, Digital audio players, Digital cameras, Mobile phones, Synthesizers,video games and so on. In addition to being non-volatile, flash memory offers fast read access times as fast as Dyanamic RAM. Due to its Mechanical shock resistance it is highly popular.

3. CONCLUSIONS

The Earthmover monitoring system play the important role in monitoring and tracing of Earthmover like the Bulldozer, Excavators, Tractors, and Poclains and heavy trucks in the remote areas, and also gives the record details of work through storing every detail. These information can be sent directly to the users cell phone or

can be stored on the memory present on the system and user can access these data when needed. The test set for this evaluation system the gives the information about the-

1) Ignition start and stop information.
2) Fuel level information.
3) Working hours with fuel consumption.
4) Lattitude and Longitude information.
5) Refuelling and Halt information.
6) Previous information and current information.

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